Dainty Swallowtail
Papilio (Eleppone) anactus
on Australian Finger Lime
(*Citrus australasica*)

METAMORPHOSIS

AUSTRALIA

Magazine of the Butterfly & Other Invertebrates Club

ISSUE NO: 90 DATE: SEPTEMBER 2018 ISSN: 1839-9819
Price $6.00 http://www.boic.org.au

PLANNING AND ORGANIZING COMMITTEE 2018

President:	Ross Kendall	07 3378 1187
Vice President:	Richard Zietek	07 3390 1950
Treasurer:	Rob MacSloy	07 3824 4348
Secretary:	Dawn Franzmann	07 3325 3573
Magazine:	Daphne Bowden (daphne.bowden1@bigpond.com)	07 3396 6334
Committees Members:	John Moss	07 3245 2997
	David Exton	0419 431 210
	Denise Turnbull	

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A quarterly meeting is scheduled in order to plan club activities and the magazine. See BOIC Programme.

CONTACT ADDRESS AND MEMBERSHIP DETAILS

PO Box 2113, Runcorn, Queensland 4113
Membership fees are $30 for individuals, schools, and organizations.

AIMS OF THE ORGANIZATION

- To establish a network of people growing butterfly host plants;
- To hold information meetings about invertebrates;
- To organize excursions around the theme of invertebrates e.g. butterflies, native bees, ants, dragonflies, beetles, freshwater habitats, and others;
- To promote the conservation of the invertebrate habitat;
- To promote the keeping of invertebrates as alternative pets;
- To promote research into invertebrates;
- To encourage the construction of invertebrate friendly habitats in urban areas.

MAGAZINE DEADLINES

If you wish to submit an item for publication the following deadlines apply:
March issue – February 1st June issue – May 1st
September issue – August 1st December issue – November 1st
All articles should be submitted directly to the Editor daphne.bowden1@bigpond.com

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COVER PAINTING

Dainty Swallowtail *Papilio* (*Eleppone*) *anactus* – painting by Lois Hughes

From the President

In pre-publication reading of each edition of our magazine, I am always reminded of the debt we owe to those who contribute to making it an informative, interesting and colourful publication. I am sure you will find much of interest in this edition. John's lengthy, well researched article on mimicry warrants a careful read with its plethora of images well supplementing the detailed text. The contributions of others then follow this rich vein. And to begin it all, we thank Lois for her creation of another beautiful cover image.

On pages 33 and 34 you will find some recollections of Bob Miller written by John. Bob was a long-time member of the Butterfly & Other Invertebrates Club and enthusiastically shared his knowledge and observations through numerous articles in the "black and white days" of the club's newsletter. For the past dozen years, Bob's passion has been the accumulation of hundreds of images of (mostly) butterfly life cycles and the creation of a great website http://www.bobsbutterflies.com.au This website will remain as a lasting legacy of a good man.

After our planning meeting on August 11th, we celebrated a rather successful 2018 activity, the conduct of a photography competition for high school students, with a presentation to prize winners. We owe a great deal to Darren Shepherd of the Toohey Forest Environmental Education centre for his advice and his network of contacts used to inform students and to accumulate their entries. You will find the winners and see their entries on pages 27 to 33.

Best wishes *Ross*

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Notes on mimicry, especially in relation to butterflies and moths, with special reference to the Dainty Swallowtail *Papilio* (*Eleppone*) *anactus* (W.S. Macleay) 1826 – *John T. StL. Moss*

Mimicry is a process whereby some organisms (or parts of organisms) [the 'mimic'] come to resemble other related or non-related organisms [the 'model'] which appears to give some protection from predation or other advantage to the former.

This is a large and fascinating subject which applies to associations between many related and unrelated invertebrates. But it also occurs within vertebrates e.g. non-venomous snakes taking on the appearance of venomous species and non-toxic frogs resembling toxic species. Taken further, there are also mimetic-like associations between vertebrates and invertebrates, for example an American rattlesnake with a moving tail appendage resembling a spider, which unsuspecting birds find attractive as food; they become the prey of the snake! Some American river turtles and deep sea angler fish also possess similar attractant devices which resemble the prey of their target species.

Mimicry is far more common among the invertebrates and a few that immediately come to mind include: ant-mimicking spiders; bee-mimicking wasps; wasp-mimicking hover flies and lacewings; a lacewing that mimics the open mouth of a snake; gregarious butterfly larvae that mimic clusters of repulsive sawfly larvae; these same larvae that (in under-leaf cluster formation) occasionally take on the appearance of a large hairy huntsman spider; and even a large moth larva that mimics the teeth and eyes of a predatory reptile!

Much has been written in many books and papers on mimicry in the insect world, especially in relation to the Lepidoptera, and over the years there have been several hypotheses and much speculation. Scientific opinion is still divided on how and why mimicry occurs, but it is generally considered that over time natural variation within a species produces some individuals which take on the appearance of another less palatable species, thus giving some protection from predation. These individuals persist and replace the less adapted ones.

Within the Lepidoptera, two fundamental forms of mimicry are accepted: Batesian and Muellerian. In a classic paper published in 1862 after his return from the tropical forests of South and Central America, the Englishman Henry Walter Bates proposed a theory to account for the superficial resemblance between butterfly species that appeared to be unrelated and in some cases between butterfly and moth species. He noted that those which were distasteful to insect predators (mainly birds and reptiles) appeared to function as models for more palatable species in the same locality. This was later, in his honour, referred to as Batesian mimicry. For some unexplained reason there is a preponderance of female butterflies in the role of Batesian mimics!

Fig. 1 Lesser Wanderer *Danaus petilia* (male) [GMcD]

Fig. 2 Lesser Wanderer *Danaus petilia* (male) [GMcD]

Fig. 3 Orange Tiger *Danaus genutia* (male) [GS]

Fig. 4 Orange Tiger *Danaus genutia* (female) [GS]

Fig. 5 Orange Tiger *Danaus genutia* (lat)[GS]

Fig. 6 Monarch *Danaus plexippus* (male) [RD]

In 1879 the German Fritz Muller propounded a theory as to the reason why several related **or** unrelated species, all distasteful to insect predators, showed a mutual resemblance, which afforded them additional protection from predation. He called these relationships "mimetic rings" and the form is referred to as Mullerian mimicry. In practice both forms of mimicry can occur in the one complex association.

However it is important to note that mimicry from the human perspective can be quite subjective. Often what appears as mimetic (due to similar appearances) may be explained by more common situations such as closely related species with shared gene pools, for example the pierid genera *Elodina* and *Eurema*, and the danaid genus *Euploea*, which all have many sibling species. The process known as "convergence" where unrelated species come to look alike due to common environmental factors would explain other mimetic-like situations.

Some butterfly books have devoted chapters (or less) in discussion on mimicry: e.g. editors Richard Vane-Wright and Philip Ackery in their 1984 world monograph *The Biology of Butterflies* included papers by R G Turner and L P Brower specifically on mimicry. Richard has also written several separate articles and papers on the subject including a paper titled *A unified classification of mimetic resemblances* (Vane-Wright 1976) which I have yet to read and look forward to doing so!
Even earlier, in 1915, Cambridge University Press published a 159 page book by R C Punnett specifically on the subject, as the work's title, *Mimicry in Butterflies*, so evidently speaks out.

Within the large Indo-Australian faunal region there are several subregions. In the Australian subregion with just over 400 butterfly species (and many thousand more moths!) the two landmark publications, entitled *Butterflies of Australia*, of Ian Common and Doug Waterhouse [editions: 1972 & 1981] and Michael F Braby [pub: 2000], provide little information on mimicry, the former devoting little over one page within the chapter on biology, and the latter providing only a few lines in the introductory chapter, with a brief mention in the relevant species descriptions. I expected the 1999 CSIRO monograph the *Biology of Australian Butterflies* to provide contemporary information on the subject, but there is only one passing dismissive reference [on p184] in the chapter on the Lesser Wanderer.

The Malayan Archipelago (sometimes referred to by geographers as Sundaland) is normally considered to be part of the large Oriental Region. Generally accepted as the "Butterfly Bible" for this subregion, Alexander Steven Corbet and Maurice Pendlebury's classic tome *The Butterflies of the Malay Peninsula* [now in its fourth (revised) 1992 edition and covering just over 1000 species], devotes four pages to discussion of two dozen mimetic rings involving both moths and butterflies, but suggests further work should elucidate many more. As the political state of Malaysia also includes the western half of the island of Borneo, and the Malayan Archipelago includes Singapore and parts of three other countries, for convenience I will refer to Peninsula Malaya just as "Malaya", as it was formally once known.

Fig. 7 Danaid Eggfly *Hypolimnas misippus* (female) [GS]

Fig. 8 Danaid Eggfly female recently emerged [GS]

Fig. 9 Orange Lacewing *Cethosia penthesilia* [GS]

Fig. 10 Orange Lacewings, emerging cluster [GS]

Fig. 11 Orange Lacewing – note black hw spots roughly in same position as *Danaus* males sex scale patch [GS]

Before moving on, it is worth mentioning here certain butterfly taxa [two species-groups in particular] that are outstanding examples of mimicry for this subregion. Firstly, one of the most widespread swallowtails, *Papilio memnon*, exhibits over its large range, many mimetic forms among its variable females, by resemblance to poisonous troidine swallowtails in the genera *Parides* and *Pachliopta*. [Females of the related *Papilio polytes* also mimic *Pachliopta* species]. According to Corbet & Pendlebury (1992), in Singapore, because of the widespread cultivation of *Citrus*, its larval food plant, *P. memnon*, once a rare jungle butterfly, is becoming more abundant and expanding its range. In addition, they state that the presumed troidine models no longer exist in the area, which could eventually lead to a breakdown of the mimetic process.

It is interesting to note that one of the locations involved in the recent spread of this species is Australia's Christmas Island, where specimens were first taken in November 1999 (Moulds and Humphrey 2000). The Braby butterfly field guide has this "new Australian" butterfly illustrated.

The other interesting species-group are swallowtails in the genus *Chilasa* which are commonly known as "mimes". All the species are mimetic and resemble species of Danainae (such as our Crows and Tigers) which are distasteful to insect predators. A few also mimic Uraniid moths, presumably as they are also distasteful. *Chilasa* has been separated from *Papilio*: on both adult and larval morphological grounds; by their distinctive male genitalia; by their slow and deliberate flight, resembling the danaid species which they mimic; and by the larval preference for Lauraceae (laurels) and not Rutaceae (citrus etc).

In relation to *Chilasa*, Corbet & Pendlebury (1992) state that "an allied genus or subgenus is found in Australia". They are of course referring to *Papilio* (*Eleppone*) *anactus*, our Dainty/Dingy Swallowtail whose taxonomic position was under review at the time. I believe we have missed an opportunity to give this butterfly the place/recognition it deserves and like *Chilasa*, split it off from *Papilio*, as David Hancock and others have shown (Hancock, 1979 and 1983). I will have more to say about this further on!

I will just make brief mention of another group of Malayan mimics which are not papilios but are nymphalids of the Satyrinae or "Browns". This specialist group of a dozen mainly palm-feeding butterflies are in the genus *Elymnias* and not surprisingly are called "Palmflies". Their models include danaids (both Crows and Tigers), various nymphalids and even some mistletoe feeding *Delias* species (Jezebels). Interestingly, in Malaya, many more *Delias* and some danaids also are mimicked by Zygaenid moths. There is only one species of palmfly in Australia and it appears not to be a mimic. However, Kelvyn Dunn is of the opinion that the male may be a mimic of an uncommon form of a *Euploea* species. This will be considered in a following paper.

Fig. 14 Japanese Fritillary Plate [note female on the Rt has white subapical bars similar to *D. petilia* (per Trevor Lambkin)

Fig. 15. Yellow Spotted Jezebel *Delias nysa* [AP]

Fig. 16 Caper Gull *Cepora perimale* winter (dry season) form [AP]

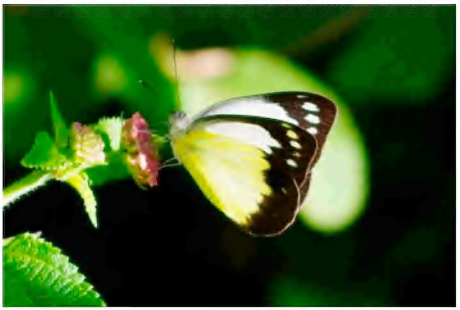

Fig. 17 Caper Gull *Cepora perimale* summer (wet season) form [AP]

Fig. 18 Yellow Albatross *Appias paulina* (female) [TB]

The Papuan Subregion, which (inter alia) encompasses the main island of New Guinea and those islands further to the east in the Solomons and Vanuatu, had been somewhat neglected in the butterfly literature until Michael Parsons' 4 years fieldwork in PNG and a further 7 years follow-up taxonomic research. What resulted is the extremely detailed and beautifully illustrated 1998 mammoth tome *The Butterflies of Papua New Guinea* which lists 959 species from the main island, with detailed accounts of the 820 known species from PNG. Parsons considers that this figure will blow out to more than 1000 species once outlying islands and montane regions are thoroughly explored. He devotes a whole chapter to mimicry in New Guinea butterflies (and moths!) [11 double column size 10 font A4 pages; at least equivalent to 22 standard A5 pages!]. I lost count of the number of butterfly and moth species included but they are arranged in nine main complexes – very impressive indeed!

Quite obviously I don't intend to go into depth of detail with delineation of mimetic Papuan species but a few which have implications for Australian species do rate a mention. Firstly, our colourful Zodiac moth, *Alcides metaurus*, which resembles a swallowtail butterfly, has several near relatives in the Papuan Subregion. One at least, *A. agathrysus*, is the model for an actual mimicking swallowtail! The butterfly, *Papilio laglaizei*, has strikingly similar wing colours/patterns as well as similar flight characteristics. Parsons (1998) mentions that the aposematically coloured gregarious butterfly larvae also resemble the moth larvae in form and function, suggesting mimicry at the larval stage [I will have more to say about larval stage mimicry]. It is rather surprising and a pity in a way that a similar relationship has not arisen with our local species. There are good images and detailed discussions of the Australian moth and its host plants in two articles of *Metamorphosis Australia*, issue no 57, June 2010.

In passing it is worth mentioning Parson's comment that three PNG *Hasora* species [iridescent greenish-blue patterned skippers in the subfamily Coeliadinae] are likely mimics of *A. agathrysus*. Partly in justification he states "This is endorsed by the lack of any *Hasora* species outside NG with silvery-blue patterned wings in this otherwise sombrely coloured genus." However, this statement is in error, as Australia does have such a species, *H. discolor*, which is one of the same three PNG species he refers to! Its northern distribution overlaps that of our *A. metaurus.* The implications of this are obvious!

I have suspected for some time that mimicry exists in our Australian pierid butterflies, and in particular with *Appias* (Albatrosses) and *Cepora* (Gulls) and between these and *Delias*. Parsons (1998) gives several examples where this occurs in PNG. In particular he states "*Cepora* are undoubtedly mimetic of *Delias* throughout the latter's range, which accounts for the general similarity of the two genera". He even includes *Mynes geoffroyi* (Jezebel Nymph) and a *Cepora* as being part of a mimetic ring with *Delias* species as the models. He further states that "*Appias ada* is almost certainly mimetic of" two *Delias* species. He gives further examples of certain lycaenids that mimic

Fig. 19 Caper Gull *Cepora perimale* summer (wet season) form [AP]

Fig. 20 Yellow Albatross *Appias paulina* (female) [RD]

Fig. 21 Red-banded Jezebel *Delias mysis* (m) [GMcD]

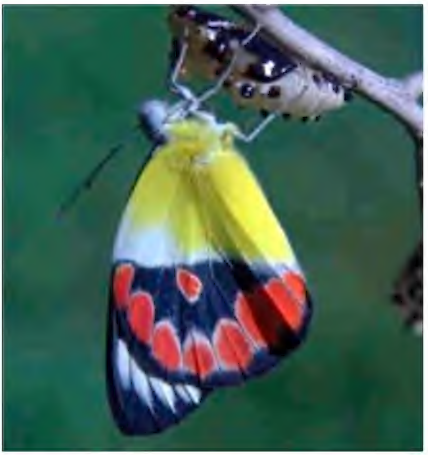

Fig. 22 Scarlet Jezebel *Delias argenthona* [JTM]

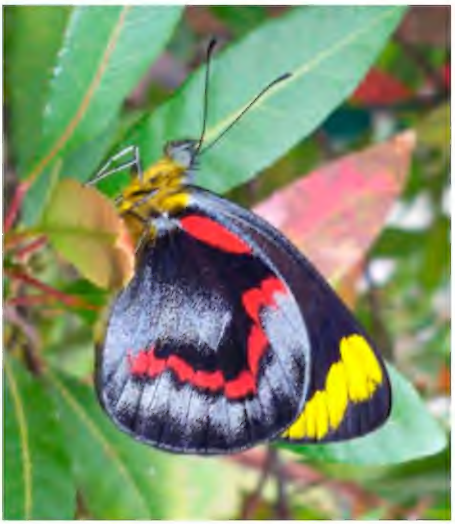

Fig. 23 Black or Common Jezebel *Delias nigrina* [JTM]

Fig. 24 Jezebel Nymph *Mynes geoffroyi* [HH]

Delias, and states that "It is probable that the benefits of mimicry within the *Psychonotis* and *Delias* complexes overlap in the PNG highlands where a majority of boldly white-marked lycaenids flutter up and down creeks, and generally resemble *Delias* in miniature". He goes on to remind us of the day-flying zygaenid moth "mimics of *Delias* in the Oriental Subregion". With all this evidence, I think it is safe to assume that *Delias* species are at least unpalatable, if not actually toxic! They must be able to synthesise toxins from non-toxic chemicals in their mistletoe host plants because it is obvious that both mistletoe fruit and leaves are non-toxic. In my experience the fruit is quite tasty and relished by many birds and fruit bats, and various arboreal marsupials eat the leaves. I will have more to say about Australian pierid mimics further on.

Parsons talks about the possibility of intrageneric mimicry associations in the smaller pierid genera such as *Eurema* and *Elodina*, with many similar species. This may appear to suggest a Mullerian mimicry situation, but there is no evidence that these species are distasteful. Why is this not just speciation on its own, in response to other environmental factors? [See my comments in para 6 above and under *Delias* below]

Although the Australian fauna has less than half the number of butterfly species compared to Malaya and Papua, we would still expect to see the same proportion of mimics. However there are actually far fewer suggested/identified as expected! As much of our butterfly fauna is related to that of PNG [excepting our southern Bassian taxa which do not appear to exhibit mimicry], using Parsons as a guide it is possible to identify many more mimetic associations. Nevertheless, with a couple of exceptions, I will leave the details of most of my own suggestions to a following paper, and focus here on just what we already agree on.

I will start with the species I last discussed in the March 2018 issue [No 88] of this magazine: *Danaus petilia* or "Lesser Wanderer" [figs 1 & 2] which also occurs in PNG and its sibling congener *D. chrysippus* [see image in P. Hendry article this issue] which in Malaya is known as the "Plain Tiger". This latter name is unfortunate because it is quite a pretty butterfly, and I like to think the name arose from it residing on the "coastal plain", but then so do its congeners! Within all three subregions the species (as well as several more *Danaus*) are models for a nymphalid butterfly, *Hypolimnas misippus* or the "Danaid Eggfly". However only its female is mimetic [figs 7 & 8]; the males closely resemble males of our *H. bolina*, the "Varied Eggfly". This is clearly a situation of Batesian mimicry, but as several other similarly distasteful *Danaus* are involved in this mimetic ring, it is also an example of Mullerian mimicry! In Australia *Danaus genutia*, the "Orange Tiger" [figs 3, 4 & 5], which occurs in the Western Australian Kimberley and the Northern Territory's "Top End", is thought to be involved. As the photos show, this uncommon species resembles both *D. petilia* and a smaller, stubbier *D. plexippus* ("Monarch" or "Wanderer") [fig 6].

Fig. 25 Scarlet Jezebel *Delias argenthona* late instar larval cluster [JTM]

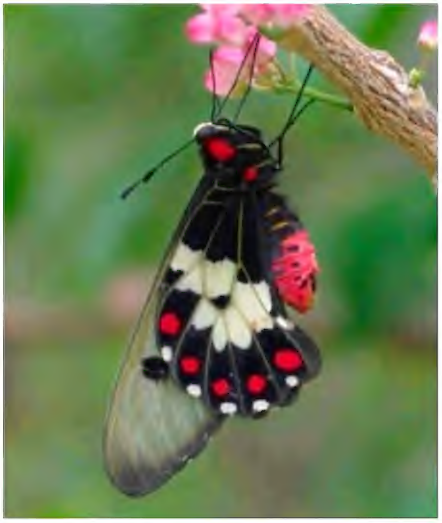

Fig. 29 Clear-winged Swallowtail *Cressida cressida* (male) [AP]

Fig. 26 Jezebel Nymph *Mynes geoffroyi* larval cluster [RK]

Fig. 30 Clear-winged Swallowtail *Cressida cressida* (male) [AP]

Fig. 31 Dainty Swallowtail *Papilio* (*Eleppone*) *anactus* [RD]

Fig. 32 Orchard Swallowtail *Papilio aegeus* female [JTM]

To further complicate matters, in all three regions look-a-like species of *Cethosia* or "Orange Lacewings" fly with the other species. These are distasteful nymphalids and would therefore constitute part of the Mullerian mimicry ring. The Australian species is *C. penthesilea* [figs 9 & 10] which only occurs in the Top End of the NT, where it flies with both *D. petilia* and *D. genutia*, as well as *H. misippus*. Interestingly (as well as the similar forewing white subapical band and general orange livery) with forewings partly overlapping the hindwings, the innermost submarginal dark spot somewhat resembles the small dark sex patch of the male *Danaus petilia*, thereby reinforcing the mimetic effect [fig 11]!

Additionally, in India, Burma, Thailand and northern Malaya, there occurs the female of a Satyrine palmfly butterfly, *Elymnias hypermnestra*, with an unusual orange-brown colour closely matching the danaids. Interestingly, further east the more typical bluish form of the female predominates, showing that this species is only a Batesian mimic for part of its large range.

Furthermore, in all three subregions another Batesian mimic of *Danaus* species has been known for some time. This butterfly in the subfamily Argynninae is the only regional representative of the *Viola* feeding Fritillary group. *Argyreus hyperbius* (the Laced Fritillary), with about 10 subspecies occurring throughout its very extensive range (Ethiopia to central eastern Australia!) is a very rare or restricted species. It no longer occurs in Queensland and sadly may in fact already be extinct in Australia [Lambkin 2017]. It is/was mainly a coastal lowland species in Australia, whereas in Malaya and Papua it is montane. Binns (1976), referring to the Australian subspecies, remarked "Both the appearance of adults in flight, and their mode of flight, bore some resemblance to that of *Danaus chrysippus petilia* (Stoll) which was common in the same area." [This was quoted (in part) in Braby 2000]. An earlier comment in Common and Waterhouse (1972), referring to the Indian subspecies, said (in part) "— resembles in flight the distasteful *Danus genutia*, and may therefore gain some protection from predators". Parsons (1998), quoting Longstaff (1912) and Punnett (1915), states that "*hyperbius* is mimetic of *Danaus chrysippus*" and "in the mountains of northern India, *hyperbius* flew up and down roads, returning again and again to the same spot". As can be seen from images of the set specimens, the Australian subspecies *A. h. inconstans* [figs 12 & 13] is not a faithful copy of these danaids, as the female lacks the white subapical forewing band that is present in females of all other foreign subspecies. Trevor Lambkin's photo [fig 14] of set specimens of a pair of the Japanese subspecies illustrates this well.

In North America where the Monarch is endemic, it has several danaid congeners; one, *D. erippus*, is so similar it is almost indistinguishable; another *D. gilippus* differs by having white spotting across all wings. These are clearly examples of Mullerian mimicry. However, another unrelated widespread nymphalid, *Limenitis* (syn: *Basilarchia*) *archippus,* the Viceroy, is strikingly similar to *D. plexippus* and *D. erippus* and clearly constitutes a Batesian mimic. It is therefore worth considering that

Fig. 12 Australian Fritillary *Argyreus hyperbius inconstans* (m) [TL]

Fig. 13 Australian Fritillary *Argyreus hyperbius inconstans* (f) [TL]

the Monarch in Australia might now be part of a pre-existing mimetic ring, and its presence may have reinforced that arrangement. Another recent Australian immigrant, *Acraea terpsicore*, the Tawny Coster, originally from Sri Lanka and the south of India, although smaller, has long been regarded as a mimic of *D. chrysippus* in its home countries. I am unsure if it is distasteful or not, but its matching colour (tawny!) will no doubt give it a measure of protection from predators in its new home! [The species is illustrated in the 2016 (rev) edition of the Braby butterfly field guide]

I mentioned above Michael Parsons recognition of Papuan pierid genera *Delias, Appias* and *Cepora* being involved with mimicry. Just as there, our own species strongly exhibit this trait, and it is the darker species of *Delias* such as *D. nigrina* and *D. nysa* that are the obvious models. For example the dry season (winter) form of *Cepora perimale* (Caper Gull) [fig 16] with its dark hindwing and forewing apices is a good match for *D. nysa* [fig 15]. I have seen these two flying together in dry vine scrub on the Brisbane River, near Ipswich. Although he makes no mention of mimicry, Michael Braby has photos of set specimens of these two in juxtaposition on p135 of his 2004 butterfly field guide and immediately adjacent on p165 of the second edition (2016) of the book. A perusal of these, as well as photos of live specimens herein, should leave no doubt as to a probable Batesian mimicry situation. An uncommon form of *Belenois java* (Caper White), *B. j. perimale*, with very dark hindwings and light yellow marginal spotting, may also be a mimic of *D. nysa*. An image of this also appears in each field guide. The fact that wet season (summer) forms of *C. perimale* [figs 17 & 19] and females of *Appias paulina* (Yellow Albatross) [fig 18 & 20] have strikingly similar undersides may simply be due to convergence or quite possibly, the latter may be an unexplained Batesian model, as its larvae feed on a potentially toxic euphorbiaceous plant. Another possibility is that, somewhere within its range, *A. paulina* and perhaps even *A. melania* (Grey Albatross) may be mimicking one of the darker *Delias* species, probably the female of *D. nysa*.

A good example of Parson's "intrageneric mimicry" is the obvious Mullerian mimicry ring involving several species of the distasteful *Delias.* The most apparent is the *D. mysis*/*D. argenthona* duo [figs 21 & 22], with bright scarlet and yellow underwing markings, whose ranges overlap north of the Tropic of Capricorn. *D. mysis* itself has two far northern sibling species (*D. aestiva* and *D. lara*) which may be part of this ring. [There are good illustrations of these latter three species on p169 of the 2016 Braby field guide]

What is well known in Australian *Delias* related mimicry is the relationship between *D. nigrina* [fig 23] and *D. mysis* with the nymphalid *Mynes geoffroyi,* appropriately named "Jezebel Nymph" [fig24]! The nymph has dark and pale forms. Braby (2000) states "males and especially females of the dark form closely resemble the respective sexes of *D. nigrina*. The pale form, restricted to areas north of Rockhampton, probably mimics *D. mysis*" which also occurs in coastal areas from Rockhampton northwards. The gregarious larvae of the Jezebel Nymph, briefly referred to in the introductory section above, may be mimicking distasteful sawfly larvae and/or *Delias* larvae [fig 25] which also feed gregariously and may or may not be distasteful. I have seen Australian cuckoos feeding on both *Mynes* and *Delias* larvae and several other hairy moth larvae which other insectivorous birds avoid, but I have never seen cuckoos, nor any other birds for that matter, eat sawfly larvae! The resting "huntsman spider" appearance referred to above is only one example of the way the gregarious *Mynes* larvae orient themselves when clustering under leaves of their host plants. Quite often the appearance is of a spoked wheel or galactic spiral which may offer some protection by confusing their avian or reptilian predators [Ross Kendall's photo, fig 26, shows one of these].

It has long been considered that ocelli or eye spots on the wings of many moths and butterflies constitute warning devices that trick avian or reptilian predators into believing that they are about to attack something more dangerous than innocuous prey. It is most effective when the ocelli are on hindwings, effectively covered by overlapping forewings, which can be quickly removed when threatened, suddenly exposing the "eyes" with a "startle reflex", confusing or frightening the would-be predator. Some moth larvae, particularly fruit-piercing moth larvae in the Catocalinae, have eye-like markings. Probably the most striking example of a moth larva with this capability is that of the rare *Phyllodes imperialis* (Imperial Fruit Moth or Pink Underwing Moth). If molested the larva [fig 27] bends its head forwards beneath the front portion of its body, stretching the skin on its dorsum, revealing what appears to be a pair of blue-black eyes and a double row of white teeth-like markings [see photo]; a most remarkable effect which would be sufficient to startle any potential avian, reptilian or mammalian predator. In addition the adult moth itself produces a

startle reflex when disturbed by suddenly exposing its bright pink "underwings" [fig28]; hence the name. Some years ago, while on the edge of the Mt Mee rainforest in south-eastern Queensland, my colleague Ross Kendall and I were startled by one such moth, which fortunately for itself immediately flew and disappeared into the forest!

Fig. 27 *Phyllodes imperialis*: 'startle reflex' of final instar larva [JTM]

Fig. 28 *Phyllodes imperialis* exposing pink markings on hindwings [JTM]

The final Australian butterfly examples to be dealt with here are two pairs of Batesian swallowtail mimics within the Papilionidae. Firstly, the troidine swallowtail *Cressida cressida* (Clearwing Swallowtail) [figs 29 & 30] is known to be toxic to insect predators, doubtlessly because it feeds on plants in the poisonous Aristolochiaceae family. It has long been accepted (Hancock 1979), because of similar morphology and flight characteristics (as well as other evidence) that the citrus feeding (tailless!) swallowtail *Papilio* (*Eleppone*) *anactus* (Dainty or Dingy Swallowtail) [fig 31] is a mimic of the male of *Cressida*. The female *Cressida* appears very different, with an almost scaleless, grease-proof paper appearance! Thus its popular alternative name "Big Greasy" [The (unspoken!) name "Little Greasy" would no doubt have referred to the much smaller *Acraea andromacha* or "Glasswing", a distasteful Batesian model whose mimics will be dealt with in a following article].

The other presumed Batesian swallowtail mimic must be the female of *Papilio ambrax* (Ambrax Butterfly) which mimics both sexes of the sympatric troidine swallowtail *Atrophaneura polydorus* (syn: *Pachliopta polydorus*) in northern Queensland and PNG [I prefer to follow Hancock (1980, 1988), Dunn & Dunn (1991) and Parsons (1998) in regards the former name]. Parsons (1998) suggests that because *A. polydorus* and *C. cressida* both feed on poisonous Aristolochiaceae they could be considered Mullerian mimics. In addition, the female of the *Papilio aegeus* (our common Orchard Swallowtail) [fig 32], with its crescentic pinkish-red hindwing spots, has a very similar pattern to *A. polydorus* and there is good reason to suspect that it acts as a good mimic at least within the range of the latter species.
I have already mentioned David Hancock's work on this family and in particular his recognition of *Papilio anactus* as uniquely different and deserving of being assigned

to its own subgenus [*Eleppone*] (Hancock 1979), analogous to the Malayan genus *Chilasa* [discussed above as being strongly mimetic of Danainae] and the South American *Heraclides*. This last genus is a known mimic of troidine swallowtails. His logically constructed 1979 paper followed his submission of a landmark M.Sc. thesis entitled "Phylogeny and biogeography of Papilionidae (Lepidoptera)" to the University of Queensland. There is a useful comparison table in his 1979 paper "Characters distinguishing the *Papilio* subgenera *Heraclides*, *Eleppone* and *Chilasa*" which describes both shared and alternative characteristics of adults, pupae and larvae as well as larval foodplants. This clearly shows the equivalent importance of all three subgenera. A further paper (Hancock 1983) consolidated his position, confirming *Chilasa* and *Heraclides* as full genera and raising *Eleppone* to full generic status. This arrangement was followed by Dunn and Dunn (1991), but all later workers chose to remain with the status quo! As an example of these differences, those of us that have bred swallowtails will know that the *P. anactus* larvae are very different from the other citrus species such as *P. aegeus*, *P. ambrax* and *P. fuscus*, which are very alike. This will be dealt with in a following paper, with comparative illustrations.

Having read Hancock's carefully thought out work, I totally agree with his conclusions and recommend that we all give consideration to treating the species as *Eleppone anactus*, which it surely deserves!

This list of mimics is not exhaustive as there are many other possibilities in the Australian fauna, including white-marked dark species such as the *Euploea* (Crows) and nymphs in the Limenitinae and Tellervinae where there is obvious mimicry. As well, I have only considered the Lycaenidae and Hesperiidae in passing. Next time I hope to present some beautiful mimics in the former group as there is no doubt in my mind (probably influenced by Michael Parsons!) that the genera *Danis, Psychonotis, Nacaduba* and *Jamides* have some striking similarities. Also I want to enlarge on mimicry in moth and butterfly larvae. If time and space permits, I may even touch on some moth to moth mimicry, for example mimics of the toxic Arctiids and others.

Acknowledgements:
For contributing photos I wish to thank Garry Sankowsky [GS], Aub Podlich [AP], Russel Denton [RD], Graham McDonald [GMcD], Todd Burrows [TB], Harry Hines [HH], Trevor Lambkin [TL], Ross Kendall [RK] and the author [JTM].
Kelvyn Dunn made useful suggestions to improve the manuscript.
Editor, Daphne Bowden, showed great patience and skill in arranging the large number of photos to my satisfaction.

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ITEMS OF INTEREST

Danaus chrysippus chrysippus f *alcippoides* (Lepidoptera: Danainae) – *Peter Hendry*

Fig. 1

On the 23rd March 2018 I was on a stopover in Singapore and had just left the Gardens by the Bay when I captured an image (Fig. 1) of a butterfly that I instantly recognized as belonging to the *Danaus chrysippus* group. Fresh on my mind was John Moss's article on the Australian species *Danaus petilia* being given full species status from its perceived position as a subspecies of *Danaus chrysippus* (Metamorphosis Australia,

March 2018). On researching the image, I came to the conclusion it was *Danaus chrysippus chrysippus* form *alcippoides*. I had this confirmed by Steven Chong after placing the image on the Butterflies of Singapore and Malaysia Facebook page.

Fig. 2

The butterfly is a form in which the brownish colour in the hindwing is replaced by white. It was first described and illustrated (Fig. 2) as a species, under the genus *Limnas*, by Moore, 1883 in the Proceedings of the Zoological Society of London. It has long since being recognized as a form of *Danaus chrysippus chrysippus*. Moore based his name, *alcippoides*, on another similar form *Alcippus* named and illustrated (Fig. 3) by Cramer, 1777 in Papillons Exotïoües 2

Photos Peter Hendry

Fig. 3

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Life history notes on the Dainty Swallowtail *Papilio* (*Eleppone*) *anactus* (W.S. Macleay, 1826) Lepidoptera: Papilionidae –

Wesley Jenkinson

Image 'Heany Park Hill' Rowville, Victoria (courtesy Kelvyn Dunn)

This well-known butterfly (previously known as the Dingy Swallowtail) has been recorded sporadically from Cape York around the eastern and southern Australian districts into South Australia. Some disjunct inland records are also known, including in the Northern Territory. It is known from coastal, subcoastal areas and areas west of the Great Dividing Range. This species has no doubt extended its distribution since the introduction of commercial citrus planting, particularly in the southern states. The adults utilise a varied

range of more open habitats including woodland, eucalypt open forest and dry scrub were the host plants are growing. They can also be found in suburban gardens where citrus trees are established.

Adults are not rapid fliers, however if disturbed they are capable of rapid speed. Males typically defend territories perching on leaves strongly chasing off other rival males. They also hilltop from late morning where they glide around in sunny open areas and settle on vegetation and sticks between 1-3 metres high depending on vegetation height. Females can be observed searching for suitable host trees to oviposit. Flight occurs in both sunny and warm cloudy conditions.

Adults of both sexes feed from small native and exotic flowers. In typical *Papilio* fashion they alight on flowers and feed with the wings constantly vibrating.

In flight adults of *P. anactus* could be confused with males of the Clearwing Swallowtail (*Cressida cressida*), although *P. anactus* are generally smaller and have a different flight pattern. *P. anactus* has more distinct markings on the forewing than *C. cressida* which has a clear forewing with two large black spots in the cell. Also *P. anactus* has a yellow and black abdomen, rather than pink and black and has the subterminal spots on the hindwing as orange-red rather than pinkish red and they are disjunct rather than a continuous semi-circle pattern as on *C. cressida*. Within this species individual adult specimens show variation in general size and slight variation in the size and shape of the markings on the upper side and underside of the wings. Sexes are very similar with the females being slightly larger than males and the abdomen is slightly shorter and wider. They are best determined by the external genitalia.

Wingspans for the pictured adult specimens are males 67mm and females 70mm respectively.

Known host plants listed by various authors in Braby, 2000 include various native and introduced species in the *Citrus* genus, and in addition *Limonia acidissi* and *Geijera parviflora* (Wilga).

Papilio (*Eleppone*) *anactus* (Dainty Swallowtail)
Images top left to right: Male, Female
Images lower left to right: Male underside, Female underside

Geijera latifolia has also been recorded as a host plant by M. Eddison (Moss, 2010). All of the known host plants occur in the Rutaceae family.

During September 2005 at Beaudesert, a female was observed laying several eggs on cultivated Rough Bush Lemon (*Citrus jambhiri*) in my garden. She slowly fluttered around the tree and then settled on a young fresh leaf with wings constantly vibrating. The abdomen was curled onto the leaf and then a single egg was laid. This process was repeated several times. Eggs were laid towards the edge of young fresh leaves on either side of the host tree. These eggs were collected and successfully raised to adults. Females will oviposit within a metre of ground level if suitable host leaves are available and occasionally eggs are laid on mature leaves.

The eggs were spherical shaped, approximately 1.0 mm wide, pale yellow when laid progressing to dark yellow over a period of days.

1st instar larva

2nd instar larva

3rd instar larva

4th instar larva

5th instar larva

First instar larvae consumed their eggshells soon after emergence. They later commenced chewing small sections from the outer edge of the leaf. Larvae were found resting openly on a fine silk pad on the upper and lower side of leaves and fed during the day. Larger larvae also rested along stems of the host plant. Larvae have an orange, scented fleshy osmeterium that they protrude which is used as a defence mechanism to deter predators when disturbed. These larvae completed five instars and attained a length of up to 42mm.

Pre-pupa

Pupa

Pupae, measuring 29mm in length, were located on the underside of a stem or a mature leaf of the host plant. They were attached with silk by the cremaster and a central girdle.

The life cycle was completed in just over 1.5 months, with egg duration 10 days, larval duration 21 days and pupal duration 16 days.

Within the new boundary of the Scenic Rim Regional Shire south of Brisbane, the species is seasonal with the adults being on the wing from September until April. The adults are absent during the colder months of the year from May to August. There are probably several generations per year in this region.

Photos, except where previously credited, Wesley Jenkinson

Acknowledgments: I would like to thank John Moss for commenting on the manuscript and Kelvyn Dunn for supplying the adult live image.

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Through their eyes: Exploring the value of butterfly learning for young children – *Hannah Powell*

Children always have, and possibly always will, love all things creepy-crawly. There are countless books, toys, games and songs that feature these fascinating creatures, however, the true beauty of this love that they share is witnessing their experiences of direct contact. Whenever a six-legged friend is brave enough to descend into the gaze of young children, there are shouts of joy, shiny eyes, children running excitedly around ensuring the entire neighbourhood is aware that "THERE'S A BUG IN THE YARD!!". They then will gather around it, chattering in quiet, almost reverent voices, about their plans to "save" the poor lost thing, about what it's called, where it came from.

In many ways, this experience is further heightened when it's a butterfly - who can so easily evade their grasp and their vision - and contact with these magical beings is so fleeting and yet so memorable when it occurs that their excitement at viewing one will last long after they have left their field of vision. They will discuss them, draw them, talk about the colours and wonder together what type it might have been, they will reenact the flight path as they spread their arms like wings and sail around the playground.

In a world where children are increasingly distanced from the natural environment, advocating for access to and knowledge about valuable elements of their world becomes a responsibility of all who care for and interact with nature. While learning about the life cycle of a butterfly on a chart is great and the *Very Hungry Caterpillar* is always engaging, it doesn't compare to children's captivation and desire for understanding when they have opportunities to engage with the real thing.

In my work, as a kindergarten teacher who also facilitates a forest school program, I have been lucky enough to encounter Frank Jordan - co-author of *Create More Butterflies* and a volunteer gardener at the site we visit weekly. During the time the children have spent exploring the natural environment in this space, Frank has been kind enough to introduce the children to a world of learning as he has helped them discover caterpillars, chrysalises, and butterfly food plants. The children, always full of questions and intrigue, began to understand what to look for, their names and what relationship the plants and other insects had with them. There is something very special about hearing a four-year-old declare confidently, "Look! It's a Blue Triangle caterpillar!! You can tell from the triangle face!"

At one point we found some chrysalises that had been infected with a parasite. The children were still very eager to bring one back to our classroom to observe and, just as Frank predicted may happen, rather than a butterfly emerging, out came a black goo! This experience opened up a range of conversations about parasites and diseases,

their role in nature, about how things do not always turn out how we'd like them to, about how we can play active roles in supporting the lives of the butterflies that do survive and prevent diseases in the first place. Had the children been learning about the life cycle of a butterfly from a book, this important discovery would not have ever happened. Frank's dedication to ensuring that butterflies still have a place in urban spaces meant that the children had an opportunity to connect with these very special creatures in an authentic and memorable way.

For those who care deeply about the smallest of our earthly companions, it's important to ensure that children can continue to have opportunities to experience the real worlds of insects and develop not only an intellectual understanding of them, but develop a relationship with them that will inspire them to continue their advocacy for life.

Photos Hannah Powell and Frank Jordan

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Mistletoe Profile – extract from **The Mistletoes of Sub-tropical Queensland, New South Wales and Victoria** by *John T. Moss* and *Ross Kendall*

Alphitonia Mistletoe

Amyema conspicua* subsp. *conspicua

Description

This is a conspicuous, compact mistletoe (forming rounded clumps) with opposite leaves (to 8 cm long and 4.5 cm wide).

It has pinkish, green (or occasionally red) flowers in umbels of paired groups of three. The petals are usually an indistinct dull-pink while stamens are long and green.

Fruit are flask-shaped and translucent greenish-yellow (to 5 mm) with a raised, circular reddish flower scar from the residual calyx.

Habitat and Host Plants

Red Ash (*Alphitonia excelsa*), Pink Ash (*Alphitonia petrei*), Black She-oak (*Allocasuarina littoralis*) and some exotics including Crepe Myrtle (*Lagerstroemia indica*) and Oleander (*Nerium oleander*) in open and closed forests as well as in suburbia.

Butterflies and Moths

- Spotted Jezebel or Wood White (*Delias aganippe*)
- Black or Common Jezebel (*Delias nigrina*)
- Trident Pencilled-Blue (*Candalides margarita*)
- Diggles' Blue or Silky Jewel (*Hypochrysops digglesii*)
- Southern and Northern Purple Azures (*Ogyris genoveva, Ogyris zosine*)

Notes

Ross discovered a new host plant for the Spotted Jezebel butterfly (*Delias aganippe*) when he found larvae on this mistletoe being hosted by a Crepe Myrtle (*Lagerstroemia indica*) near his Brisbane home although subsequent attempts to raise larvae on the mistletoe have proved unsuccessful.

P.S. In 2017, Ross successfully raised a batch of *D. aganippe* on this mistletoe.

Delias nigrina fresh egg cluster (RK)

Amyema conspicua plant on *Alphitonia excelsa* (JM)

Amyema conspicua leaves (RK)

Amyema conspicua buds (RK)

Amyema conspicua flowers (RK)

Amyema conspicua fruit (RK)

Photos Ross Kendall (RK)
John Moss (JM)

STUDENT PHOTO COMPETITION

Congratulations to all prize winners. Joint first prize winners were Abbey Anstey-Walsh and Alexander Davies. Second prize winner was Erin Hickey and third prize winner was Jackson Nugent.

Ross with Abbey and Alexander

Ross with Erin

The following are the entries received from the prize winners and are reproduced with their permission.

Abbey Anstey-Walsh, Grade 11, Brisbane Girls Grammar School

This original photograph features a Monarch Butterfly. It was taken on a cattle farm 10 Km outside of Beaudesert, Queensland, in July, 2017 using a Nikon D5600. The Monarch Butterfly (*Danaus plexippus*) is a Milkweed Butterfly, belonging to the subfamily Danainae, and in the family Nymphalidae. Other common names include Milkweed, Common Tiger, Wanderer, and Black Veined Brown Butterfly.

The Monarch Butterfly is considered an iconic pollinator species. Its wings feature a black, orange, and white pattern, with a wingspan of 8.9–10.2 cm. While the Monarch Butterfly is embraced as a part of the Australian ecosystem, it is native to North America, and is dependent on plant hosts from other areas of the world. Their presence in Australia was first recorded in 1870, and the Monarch Butterfly can now be found in Eastern and Southern Australia.

The life cycle of a Monarch butterfly consists of four stages, the egg, the larvae (caterpillar), the pupa (chrysalis) and the adult butterfly. The Monarch butterflies host plant is Milkweed, a group of plants which, when its external skins are penetrated, exude a latex-like poison. The Monarch Butterfly relies on Milkweed for protection during the caterpillar stages. The Monarch Butterfly has a certain tolerance to Milkweed, so after two weeks of feeding, the caterpillar pupates on the poisonous plant, using its toxins as protection from predators. After three weeks it emerges in Summer as a butterfly. When the Monarch butterfly consumes Milkweed, it excretes the toxins it gains from the plant to its own exoskeleton. These toxins act as an effective protection from other predators. During the butterfly stages the butterfly's diet consists of nectar from different plants. The Monarch butterfly plays an important role in the Australian Ecosystem through pollinating flowers and offering a food source, to those animals who can withstand the milkweed toxins. These predators include mice and birds such as the Pied Currawong and the Black-faced Cuckoo-shrike.

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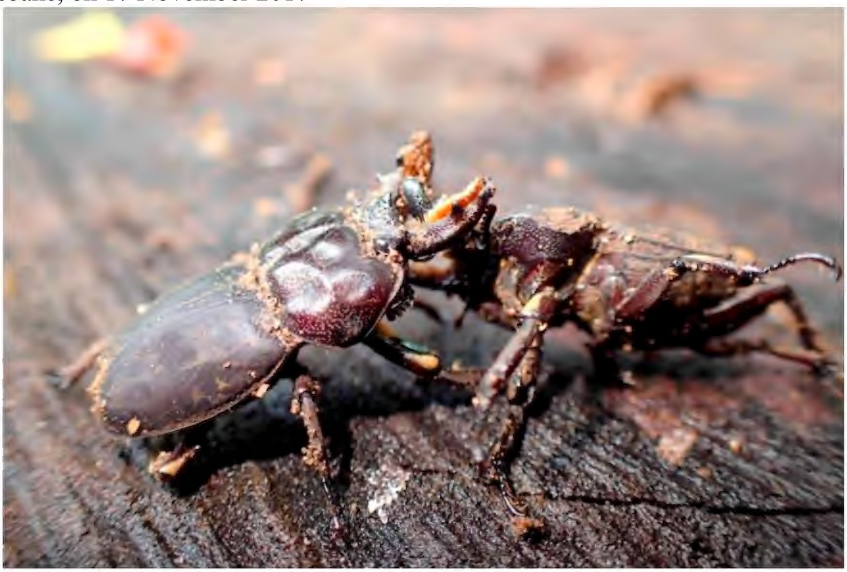
Alexander A Davies, Year 10, Ambrose Treacy College, Indooroopilly

"**Clouded Battle**" – Photographed at Ambrose Treacy College, Indooroopilly, Brisbane, on 17 November 2017



"Clouded Battle" *

The brown stag beetle or mottled stag, *Ryssonotus nebulosus* (Kirby, 1819) (Coleoptera: Lucanidae) is a medium sized stag species with males usually 22-33mm long and females slightly smaller, 21-29mm. The mottled stag beetle is commonly encountered in damper areas of Brisbane and is arguably the most common stag beetle in south eastern Queensland, being found in a wide variety of environments from dense sub-tropical rainforest to well-watered suburban gardens, so long as the area in question is moist and has plenty of rotting logs. It is unlikely to be confused with other species, although small, dull females can be confused with the rare and more elusive *Safrina* spp, which are found in woodlands and forests at moderate to high elevations.

Ryssonotus nebulosus has a unique dull black or brown pattern on its elytra with elaborate reddish brown, greyish or light brown markings, though this pattern may appear absent in dead or moist specimens due to the release of a fatty liquid which permeates the surface of the elytra. Like most stag beetle species, the brown stag beetle is sexually dimorphic with males having long mandibles with dense golden-brown setae on their inner margins, with prominent coarse "teeth" on the outer margins. The mandibles of the females are much shorter and have far less setae and do not have strong "teeth" on the outer margins.

The species is not particularly host specific and I have found it at Indooroopilly under, and feeding on a variety of decomposing logs, including African Coral-tree, Jacaranda, Privet, *Eucalyptus*, Hoop Pine and *Casuarina*. It is one of the few stag beetles that has been recorded under rotting palm logs e.g. Bangalow and Queen palms. The life cycle is completed in one year, and I have observed adults over the summer months from November till late February with some even coming to bright lights at night. Larvae can be found throughout most of the year. Fortunately, this species is not of conservation concern and thrives in disturbed areas. My photograph depicts two males jousting or wrestling with each other, which is a well-documented behaviour of the European stag beetle but to date, I believe my photograph is the first recorded incident of male *R. nebulosus* fighting. Males battle for breeding rights and the male on the right appears to be losing as it is being flipped over.

*The specific name for this stag beetle is derived from the Latin word '*nebula*' meaning cloud or fog.

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Erin Hickey, Year 11, Ipswich Girls Grammar

His majesty, the monarch

This photo was taken on the 6th of May 2018 when my family and I went to Lake Manchester to have a look around. I was there that I came across this Monarch butterfly as well as two dragonflies. The monarch butterfly or simply monarch (the binomial name being Danaus plexippus) is a milkweed butterfly (subfamily Danainae)in the family Nymphalidae. Other common names depending on region include milkweed, common tiger, wanderer, and black veined brown.

The monarch is considered an iconic pollinator species.[6] Its wings feature an easily recognizable black, orange, and white pattern, with a wingspan of 8.9–10.2 cm (3 1⁄2–4 in). Among the two species of Monarch butterflies, the one in North America differs from the one you will find in South America, but the Caribbean is home to both species. You can also see them in Australia, New Zealand, and several Islands lying between Australia and Tahiti, in parts of Europe and in Hawaii.

The following are some interesting facts about the monarch butterfly:
• Monarchs were transported to the International Space Station and were bred there.
• A black spot on an inside surface of its hind wing distinguishes the male Monarch butterflies from the females.
• The monarch butterfly does not have lungs; breathing takes place through tiny vents in the thorax or abdomen called spiracles, and an organized arrangement of tubes called trachea, distribute the oxygen through the Monarch's body system
• They have a 10 cm wingspan and weigh between 0.25 to 0.75 grams
• The wings flap slower than other butterflies at about 300 to 720 times a minute
• They have a broad spectrum perception of colours and can see even the UV light that humans cannot
• Their process of communication uses colours and scents. Chemical discharged from the rear wing glands help the males to attract its mate
• The Monarch butterfly can cumulatively lay about a maximum of 250 eggs per day at the rate of one egg at a time. The witnessed highest number of eggs laid by a monarch butterfly in captivity is 1179
• These butterflies use their eyes to locate flowers, they use their antennas to smell the nectar and the minute receptors lodged in their feet called "tarsi" come in handy to taste sweet substances
• Monarch butterflies store a poison called Cardiac Glycosides that they had ingested by feeding on the leaves of the milkweed foliage in their larva stage. These are sometimes harmful to its vertebrate predators, but ineffective on invertebrate predators. The toxic effect on vertebrates however, depends on the level of intake. These toxins provide these butterflies with a poisonous defense against its predators such as lizards, birds, and frogs.

Despite its supposedly slow speed, I had much difficulty achieving this shot. The monarch stayed far and high up for the majority of my pursuit, hardly ever resting anywhere. I attempted to take photos regardless, which resulted in many blurry images of the airborne butterfly. However at one of the very few times the butterfly rested, I was successful in taking this photo. Definitely worth the struggle I think. Information taken from https://www.monarch-butterfly.com/monarch-butterflies-facts.html and https://en.wikipedia.org/wiki/Monarch_butterfly

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Jackson Nugent, Year 11, Brisbane Grammar School

Attached is my entry to the year 9-12 Invertebrate photo competition. It is a species of sparassid, a family of araneomorph spiders (modern spiders) colloquially known as huntsmen, that was photographed at Moreton Island off the coast of South East Queensland. It was identified on iNaturalist.org as *Isopedella flavida*, which seems to match its appearance. The full classification of this species is as follows:

Kingdom: Animalia
Phylum: Arthropoda
Subphylum: Chelicerata
Class: Arachnida
Order: Araneae
Suborder: Araneomorphae
Infraorder: Entelegynae
Family: Sparassidae
Subfamily: Deleninae
Genus: *Isopedella*
Species: *I. flavida*

Huntsman spiders are strictly predatory animals that predominantly prey on insects such as crickets and cockroaches. However, larger species such as *Holconia immanis*, *Isopeda vasta* and *Beregama aurea* are more than capable of preying on small vertebrates such as lizards. While formidable predators, huntsmen fall prey to a wide variety of other animals. Birds, lizards and small mammals will gorge on any huntsman they can catch. Among the invertebrates, their most prominent threats are the wasps of the family Pompilidae, which capture and paralyse huntsmen and other spiders in order to provide a living larder for their young. Other invertebrate predators of huntsmen include large centipedes such as those in the genera *Ethmostigmus* or *Scolopendra*, ants, scorpions, Onychophorans (velvet worms), and other spiders. Huntsmen are found in a wide variety of habitats, from the deserts to the tropics. This individual was found in dry scrubland with dense vegetation. Huntsmen are often to be found beneath rocks/logs or under bark, where their greatly flattened profile allows them to shelter in the thinnest of crevices. They are among the most widely distributed of all hunting (non web/lair bound) spiders.

Mating for a huntsman is as risky an affair for the male as with any other spider. Females are generally larger, and may attack and eat an approaching male. Prior to mating, mature male huntsmen ejaculate onto a “sperm web” before transferring it into a pair of palps – syringe-like structures located on the end of leglike appendages called pedipalps. When he copulates, he uses these to inject sperm into the female. Female huntsman lay silk egg sacs, which may be attached to vegetation, or carried around by the mother. Newly hatched individuals (known as spiderlings) resemble their parents throughout their lifecycle, and undergo several molts throughout their lives as they grow. Hunstman spiders can live 2 – 3 years, which is rather long for an araneomorph, but falls far short of the lifespans of many mygalomorphs (ancient spiders) which can live for one or more decades.

Given their wide distribution and predatory lifestyle, it is hardly surprising that they play an important role in an ecosystem; managing populations of insects and other small invertebrates – a role that spiders as a whole should be commended for. They often enter human habitation, where their intimidating appearance generally causes them to be greeted in a less-than-friendly manner. However, huntsmen are not medically significant, though some, such as the Badge Huntsman (genus *Neosparassus*) deserve a degree of respect.

UNDER THE MICROSCOPE

Are you able to identify this image?

See page 38 for the answer.

Photo Trevor Lambkin

OBITUARY

Some recollections of my old mate Bob Miller – *John T Moss*

Long time BOIC member Robert (Bob) Miller passed away on the 11th of July 2018. Although I had not seen nor heard from Bob for many years, I remember the great

times we had on collecting trips and other excursions chasing up elusive butterflies and moths and occasionally cicadas and other insects.

In those days Bob, wife Judy and their two sons, lived at Landsborough in the Sunshine Coast hinterland. Because of this many of our activities were centred on the Maleny area, Blackall and Conondale ranges. Along with other members of the Butterfly and other Invertebrates Club, we observed, photographed and collected during the day and often ran mercury vapour UV light sheets in the evenings to bring in the nocturnal insects. No doubt the most memorable of these was *Phyllodes imperialis*, what we then called the Imperial Fruit Sucking moth, but now generally known as the Pink Underwing Moth! I recall Bob being with me when I photographed the spectacular larva of this moth [see photo this issue].

Several trips involved searches for *Argyreus hyperbius inconstans*, the missing Australian Fritillary butterfly, which had disappeared from its historical locations in Southeast Queensland. After many futile searches in SEQ we decided to go further south into NSW. As there had been a possible sighting in the Bilinudgel Nature Reserve, north of Brunswick Heads, we checked it out but found nothing, including little if any of its known foodplant, the Arrowleaf/Arrowhead Violet. So we eventually discounted the possible sighting as unlikely. Another single trip involved travelling further south to Port Macquarie where it had been collected in the past. Besides Bob and I, the group included Graham Forbes, Frank Jordan and Russell Stoodley. On this occasion, April 2001, we were lucky and found one quite small male specimen, which to date remains the last of its species observed or collected in any of its previous haunts!

I recall Bob always being generous in sharing butterfly life history information with us. Much of this was his original observations, including discovering new larval host plants. Because of his rigorous approach to accurate recording, most of Bob's new data I included in the various editions of the butterfly host plant book I had compiled for the club. We could always count on him giving us his spare specimens as he only kept what he needed and always had an ethical approach to sustainable collecting.

Many of Bob's observations were written up in his inimitable style, and published in the newsletter forerunner to the club magazine *Metamorphosis Australia*. Several more with colour images were published in the magazine itself and these will be a permanent record of much of his work. He also contributed greatly to the newsletter/ journal of the Maleny-based Barung Landcare.

Probably the most fitting memorial to his work in his former local area is the revamped display case of butterflies he donated to the Mary Cairncross Scenic Reserve. This sits prominently among the display items in their new Discovery Centre.

Bob has made many friends and colleagues during his lifetime of insect and plant study, and his inevitable passing [after an incredible 10 year battle holding his cancer at bay!] will be mourned by all of them. Vale Bob

Ed.: Bob's family is planning to hold a remembrance weekend at the end of September at Brampton Beach, south of Cairns. If you would like further information, please contact Judy Miller on 0423 087 743.

REPORTS

BOIC Field Trip – Boondall Wetlands, Western Extension

28/4/2018 – *Russel Denton*, a volunteer guide at Boondall Wetlands Environment Centre and also a member of BOIC

For the entire trip, 21 species of butterfly were sighted, including a new species for the wetlands, a Lyell's swift, (sighted by Michael Hutchison) which has been added to the butterfly list for Boondall Wetlands which now stands at 61 species. I have been recording butterflies at this site for the last few years.

The species of butterfly sighted on the walk are:

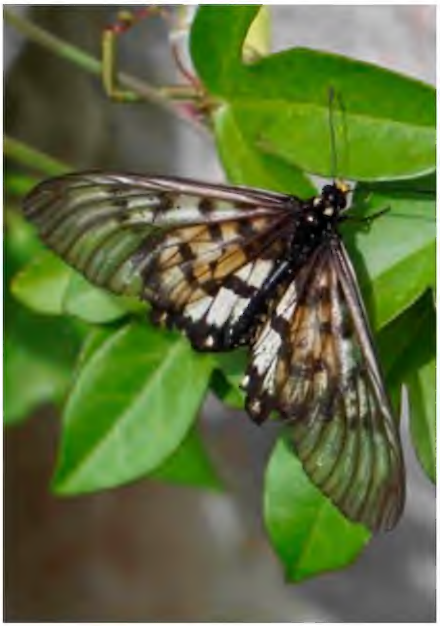
1. Brown Ringlet
2. White-banded Line-blue
3. Common Crow
4. Wanderer/Monarch
5. Large Grass-yellow
6. Clearwing Swallowtail
7. Small Green-banded blue
8. Evening Brown
9. Blue Tiger
10. Long-tailed Pea-blue
11. Lemon Migrant
12. Meadow Argus
13. Tailed Emperor
14. Large Purple Line-blue
15. Common/Varied Eggfly
    both male and female sighted
16. Small Dusky Blue
17. No-brand Grass-Yellow
18. Swamp Tiger
19. Yellow Albatross
20. Glasswing (spotted laying eggs)
21. Lyell's Swift

Other insects spotted

1. Spittlebug *Philagraparva*
2. Bark-mimicking Grasshopper
3. 28-spotted ladybeetle
4. Azura lydia (moth sp.)
5. Coastal Golden Orb Weaver
6. Leaf-curling spider
7. *Pediana regina* (Huntsman sp.)
8. Two-spined spider
9. *Euproctis lutea* (moth species)
10. Red-shoulder lycid beetle
11. Brown Stink Bug (*Oncocoris apicalis*)
12. *Gnamptoloma aventiaria* (moth sp.)

Common Crow (*Euploea core*)
Photo Denise Turnbull

Monarch (*Danaus plexippus*)
Photo Denise Turnbull



Glasswing (*Acraea andromacha*)
Photo Denise Turnbull

Brown Ringlet (*Hypocysta metirius*)
Photo Denise Turnbull

Common Eggfly (*Hypolimnas bolina nerina*) – Photo Dennis Taylor

Overall, the small group thoroughly enjoyed themselves and even the 10-15 minutes of rain didn't bother them.

I would like to thank all who participated, in particular, Michael Hutchinson for sighting the Lyell's Swift which, as I stated above, is the 61st species of butterfly that has now been recorded for Boondall Wetlands. Hopefully, I will continue to find more species of butterfly in the wetlands to record and share with the BOIC.

Azura lydia – Photo Russel Denton

No-brand Grass-yellow – Photo Russel Denton

Red-shoulder lycid beetle – Photo Russel Denton

Unknown lycid beetle – Photo Russel Denton

Gnamptoloma aventiaria – Photo Dennis Taylor

Brown Stink Bug (*Oncocoris apicalis*)
Photo Dennis Taylor

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12th May 2018, Speaker: Dr Tim Heard – Topic: Australia's stingless bees, Flagships for insect popularization – *Denise Turnbull*

Fast facts
Stingless bees:

- are found in tropical and sub-tropical areas of America, Africa, Asia and Australia
- don't sting

- do bite, however, the bite feels like a tickle because they have weak jaws
- have had their honey extracted by indigenous peoples across the world, e.g. Australian Aboriginal peoples and Malaysians, who used it for medicine, food and cultural purposes
- in Central America were kept in earthenware pots
- in Indonesia are sourced from native forests and placed in bamboo honeypots. These honeypots are so popular and expensive that they are now driving exploitation of the forests.

In 1984, inspired by bee taxonomist, Elizabeth Exley, Tim began research into whether native bees would be suitable for crop pollination, as they were abundant on macadamia and cashew nut trees. At this stage there were no hive propagation techniques for native bees. By fluke, with Geoff Monteith, then Curator of the Qld, Museum, they rescued a hive and placed it in a box and determined that an additional empty box on top would allow for the colony to grow. In 1987, Chris Porwell identified how to successfully transfer rescued nests into artificial hives.
From these beginnings, the keeping of native bees has exploded in popularity, with schools, councils, men sheds, community gardens and indigenous groups showing interest in keeping 'B&Bs' for bees. The most common native bee in Australia is *Carbonaria*, and is the best for keeping as it is a subtropical species. It collects pollen for fermentation purposes, and nectar for honey, and doesn't hibernate. Compared with honey bees which produce up to 50kg of honey per year, stingless bees only produce 1 kg. It appears that honey production is not the prime reason people keep stingless bees. Rather, it would appear that Australians are becoming more ecologically driven, as over a short period of time, Australia's stingless bees have gone from obscurity to popularity.

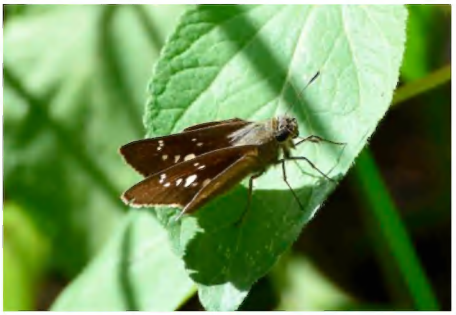
UNDER THE MICROSCOPE

And the answer is ….. The bug is *Lethocerus insulanus* (Belostomatidae), the giant fish killer bug, around 70mm long. This specimen is from Dauan Island, in Torres Strait.

Photo Trevor Lambkin

YOU ASKED

Hello Michael
Thanks for sending photos of that nondescript grey skipper butterfly from the Boondall Wetlands for identification. I noticed that it was resting on a leaf of the common and widespread Blue Billygoat Weed (*Ageratum houstonianum*).



Photos Michael Hutchison

I am fairly certain your lovely and clear photos are of a female of the Lyell's Swift (*Pelopidas lyelli*), named after the Victorian lepidopterist George Lyell by Lord Rothschild in 1915, from specimens collected on Karkar I, PNG [was Dampier I] by A. S. Meek. On examining specimens in the Tring Museum [which he established], Rothschild was the first to notice that the species was distinct from the so-called "Common" (now Dingy) Swift (*P. agna*) and other Indo-Australian congeners. The technical details for differentiation of females of these two species include the relative positions of the two cell spots and the spot above vein 1a + 2a in the forewing.

I have recently seen one in my garden. Don't know what its native host plants are, but it feeds on the exotic Johnson Grass (*Sorghum halepense*) near where I live in the Redlands. However, I discovered the native host of the Dingy Swift in bushland near here when I caught a female laying eggs on the grass *Ischaemum australe*. Prior to that it was only known to feed on exotic grasses including rice (*Oryza sativa*). Braby's updated field guide [2ed, 2016] lists some northern Australian native grasses for Lyell's Swift, but it would be interesting if we could find its local SEQ native hosts.
John Moss

BUTTERFLY AND OTHER INVERTEBRATES CLUB PROGRAMME

Planning and General Meeting

What: Our quarterly planning meetings are informative and interesting and we welcome members to contribute to discussion. The meeting will be followed by David Exton speaking on jellyfish.

When: Saturday 10th November 2018, commencing at 10.00am

Where: Downfall Creek Environment Centre, Rode Road, West Chermside

What to bring: Enthusiasm is welcome**.** Morning tea will be provided.

If attending, please respond to Dawn Franzmann (ph 3325 3573; 0419 786 369 or email berndawn@gmail.com)

DISCLAIMER

The magazine seeks to be as scientifically accurate as possible but the views, opinions, and observations expressed are those of the authors. The magazine is a platform for people, both amateur and professional, to express their views and observations about invertebrates. These are not necessarily those of the BOIC. The manuscripts are submitted for comment to entomologists or people working in the area of the topic being discussed. If inaccuracies have inadvertently occurred and are brought to our attention we will seek to correct them in future editions. The Editor reserves the right to refuse to print any matter which is unsuitable, inappropriate or objectionable and to make nomenclature changes as appropriate.

ACKNOWLEDGMENTS

Producing this magazine is done with the efforts of:

- Those members who have sent in letters and articles
- Lois Hughes who provided the cover painting
- Daphne Bowden who works on layout, production, and distribution
- Kelvyn Dunn, John Moss and Ross Kendall for scientific referencing and proof-reading of various articles in this issue of the magazine

ARE YOU A MEMBER?

Please check your mailing label for the date your membership is due for renewal. If your membership is due, please renew as soon as possible. **Annual membership fees are $30.00 for individuals, schools, and organizations**. If you wish to pay electronically, the following information will assist you: BSB: **484-799**, Account No: **001227191**, Account name: **BOIC**, Bank: **Suncorp**, Reference: your membership number and surname e.g. **234 Roberts.**

Butterfly and Other Invertebrates Club Inc.
PO Box 2113
RUNCORN Q. 4113

Next Club event: Planning and General Meeting - Saturday 10th November 2018